Amendments to the Claims

1. (currently amended) ~~A model stored in a memory describing a transcoded video~~ A method for transcoding a video, comprising:

~~a first rate-distortion function modeling a requantization of an input video corresponding to the transcoding video;~~

~~a second rate-distortion function modeling a resynchronization marker insertion rate for the transcoded video; and~~

~~a third rate-distortion function modeling an intra-block insertion rate for the transcoded video~~

modeling a requantization of an input video as a first rate-distortion function of an input video;

modeling a resynchronization marker insertion rate as a second rate-distortion function of the input video;

modeling an intra-block insertion as a third rate-distortion function of the input video; and

transcoding the input video according to the first, second and third rate-distortion functions to produce an output video, in which the input video has a first bit rate greater than a second bit rate of the output video, and a distortion D is expressed as

$$D = [\prod_{i=0}^{L-1} \Phi(\omega_i)]^{1/L} \cdot e^{-\beta \cdot R(D)},$$

where L is a total number of frequency coefficients of a discrete cosine transform in the input video, $\Phi(\omega_i)$ is a power spectrum density function of coefficient i, R is the second bit rate, and β is 2ln2.

2. (currently amended) The ~~model~~ method of claim 1, further comprising:

~~a bit allocation control module configured to receive the input video and allocating bits to the transcoded video according to outputs of the first, second, and third models~~

allocating bits of the input video to the output video according to the first, second, and third rate-distortion models.

3. (currently amended) The ~~model~~ method of claim 1, in which the first rate-distortion function outputs a quantization parameter, the second rate-distortion function outputs the resynchronization marker insertion rate, and the third rate-distortion function outputs the intra-block insertion rate.

4. (currently amended) The ~~model~~ method of claim 1, in which inter-frame dependencies in the ~~transcoded~~ output video are due to a requantization distortion in a current frame of the ~~transcoded~~ output video that is propagated to a next frame of the ~~transcoded~~ output video through motion compensation, and further comprising:

modifying the first rate-distortion model ~~is modified~~ for the next frame to account for propagating the ~~requantizing~~ requantization distortion.

5. (canceled)

6. (canceled)

7. (currently amended) The ~~model~~ method of ~~claim 6~~ claim 2, in which β is a variable, $R(D)$ is replaced by $R^{\gamma}(D)$, ~~where λ is~~ where γ is a Lagrange multiplier, and $[\prod_{i=0}^{L-1} \Phi(\omega_i)]^{1/L}$ is replaced by a variance σ^2, so that the distortion is

~~$D = \sigma_k^2 e^{-\beta R^2(D)}$~~

$$D = \sigma^2 e^{-\beta R^{\gamma}(D)}.$$

8. (currently amended) The ~~model~~ method of claim 7, in which β is in a range of [1, 10], and γ is in a range of [0, 1], so that the distortion is

$$D_0 = \sigma_0^2 e^{-\beta_0 R_0^{\gamma_0}},$$

where D_0 is a distortion of an intra-coded frame of the ~~transcoded~~ output video caused by the requantization, and R_0 is the first bit rate.

9. (currently amended) The ~~model~~ method of claim 8, further comprising:

~~means for~~ estimating β and γ from two sample points on the first, second and third rate-distortion functions.

10. (currently amended) The ~~model~~ method of claim 8, in which the allocating operates on groups-of-frames of the ~~transcoded~~ output video to account for inter-frame dependencies in the input video due to a requantization distortion in a current frame of the output video that is propagated to a next frame of the output video through motion compensation, and further comprising:

~~means for~~ changing the variance σ_k^2 to σ_k^{*2} to model the inter-frame dependency, ~~and~~ in which a distortion of requantized inter-frames is

$$D_k = \sigma_k^{*2} e^{-\beta_k R_k^*} = (\sigma_k^2 + \alpha_k D_{k-1}) e^{-\beta_k R_k^*}, \quad k = 1, 2, \ldots, N-1,$$

where $\sigma^{*2}_k = \sigma^2_k + \alpha_k D_{k-1}$, ~~and D_k — 1~~ D_{k-1} denotes a quantization residue error produced when a previous frame of the input video is requantized with a larger quantization-scale, α_k denotes a propagation ratio, which is determined by an amount of motion compensation, ~~and~~ $\alpha_k D_{k-1}$ models the inter-frame dependency between the current and the previous frame, and N is a total number of frames in a group-of-frames.

11. (currently amended) The ~~model~~ method of ~~claim 1~~ claim 2, in which the bits allocated for inserting the resynchronization markers ~~is~~ are determined from a number of bits in a resynchronization header and a resynchronization marker spacing, and the bits allocated for inserting the intra-blocks ~~is~~ are determined from ~~an~~ the intra-block insertion rate and an average rate increase by replacing inter-coded block with intra-blocks.